Decentralized Architectures: Blockchain and Beyond

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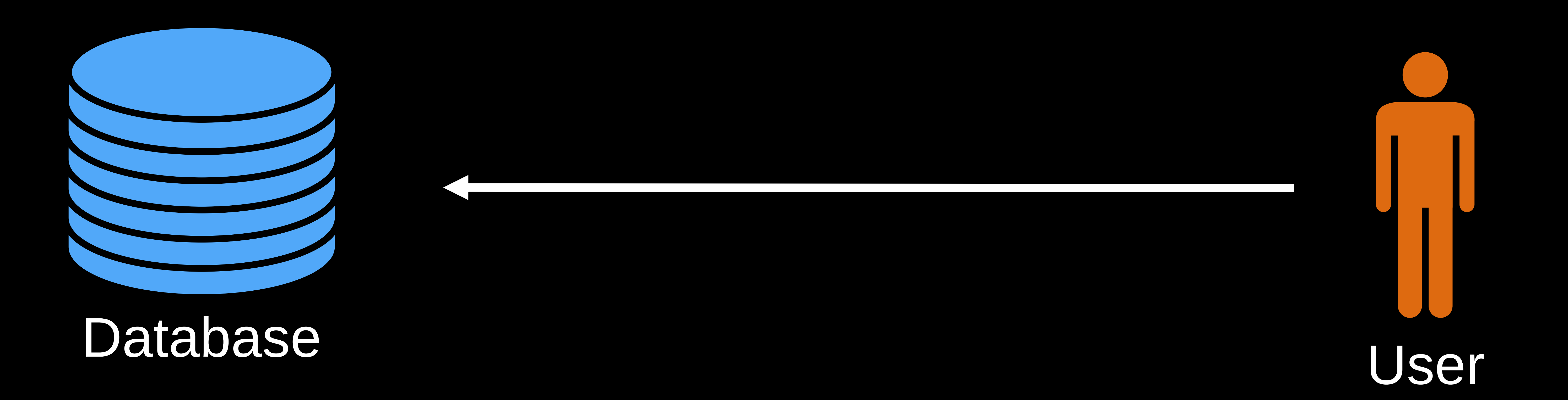


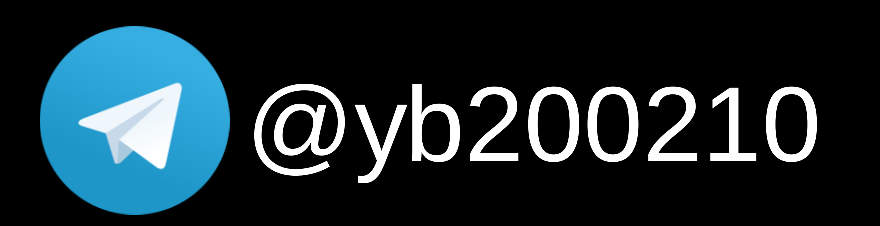

Warning!


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Centralized

```
 50 John → Lucy
120 Lucy → Anna
 73 Anna → John
 15 John → Anna
```

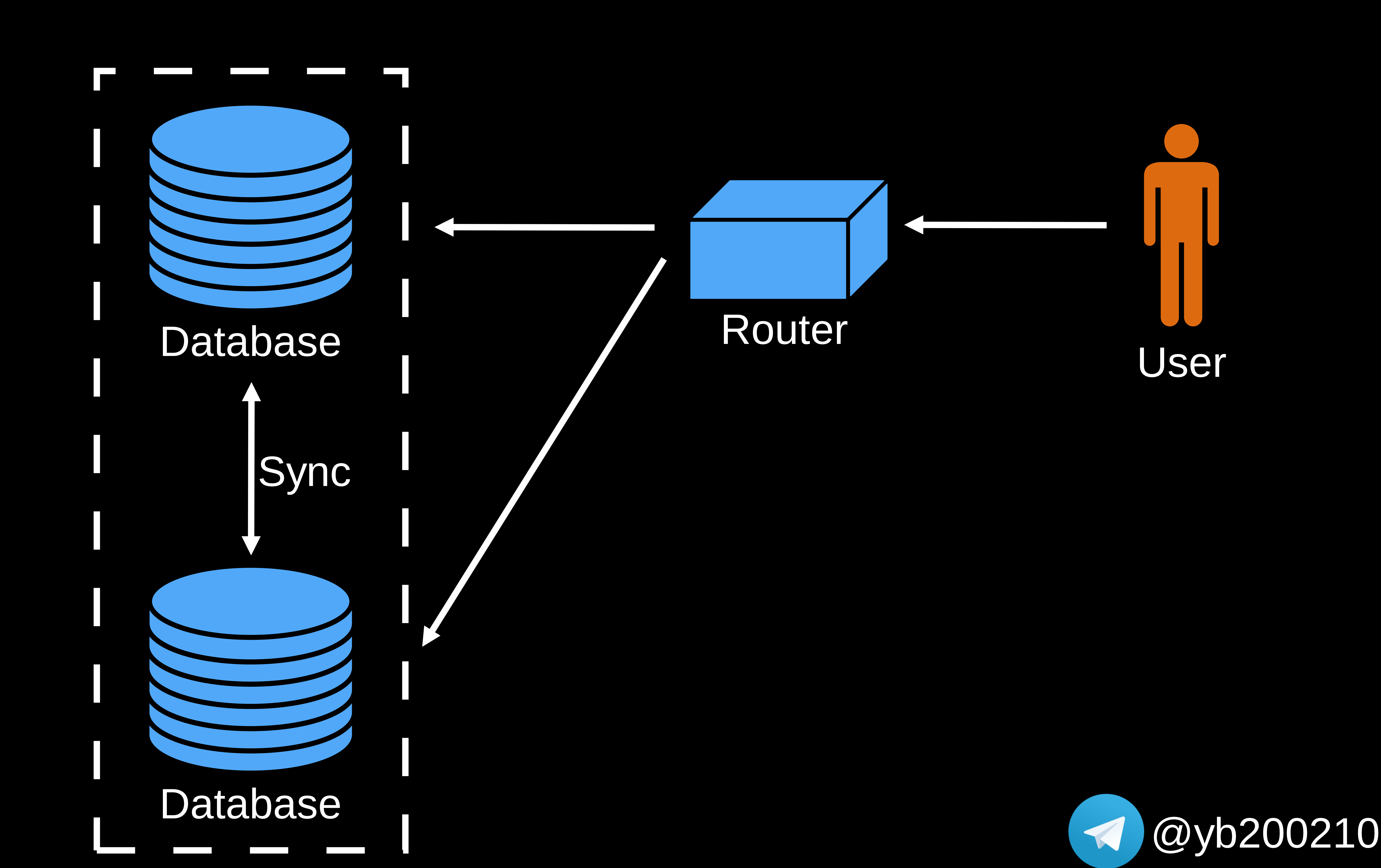




Centralized + distributed

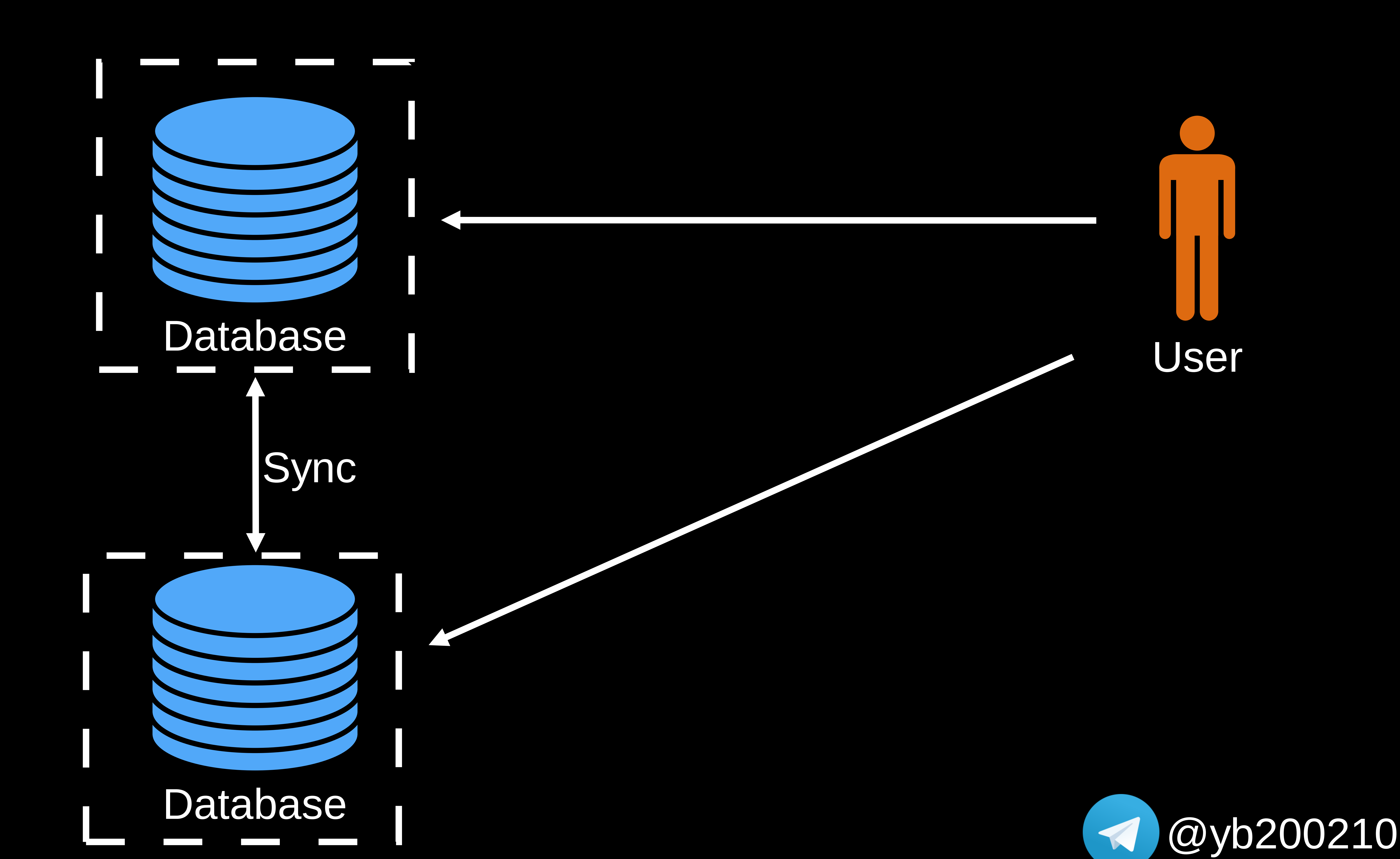
```
 50 John → Lucy
120 Lucy → Anna
 73 Anna → John
 15 John → Anna
```

```
 50 John → Lucy
120 Lucy → Anna
 73 Anna → John
 15 John → Anna
```



Decentralized

50 John → Lucy
120 Lucy → Anna
73 Anna → John
15 John → Anna



50 John → Lucy
120 Lucy → Anna
73 Anna → John
15 John → Anna

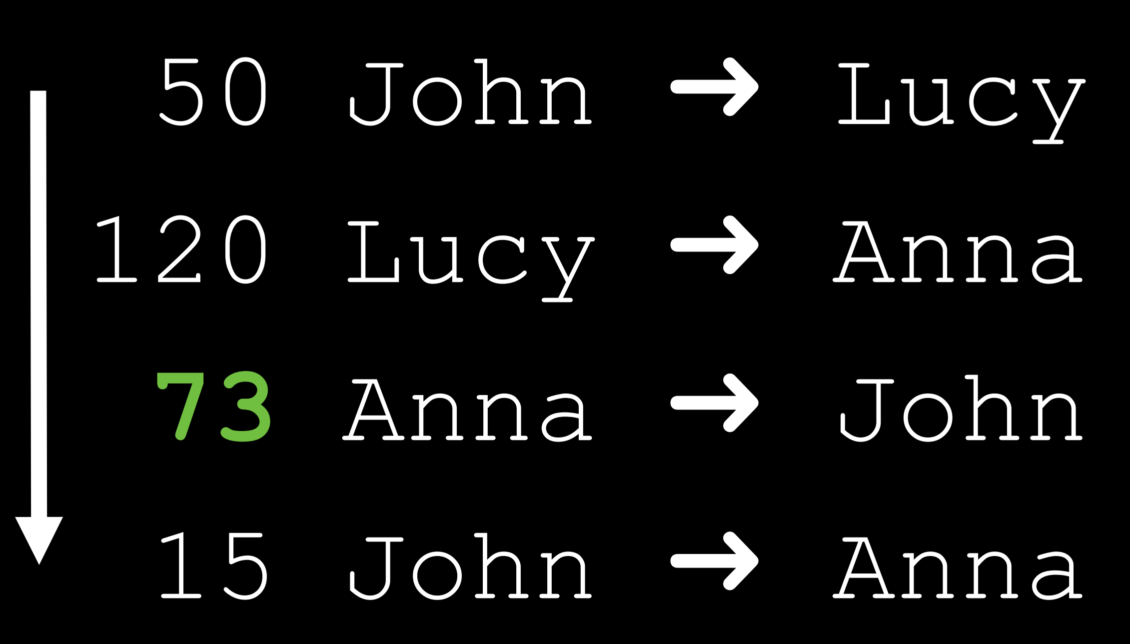
Zero-Trust Decentralization

50 John → Lucy
120 Lucy → Anna
77 Anna → John
17 John → Anna



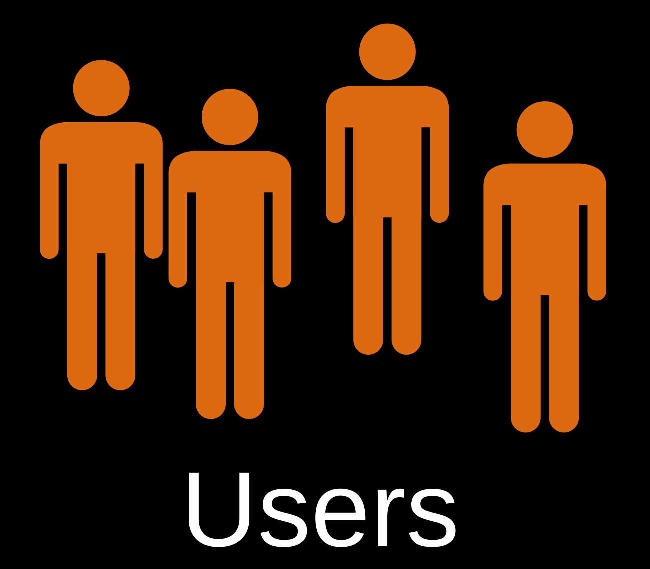
50 John → Lucy
120 Lucy → Anna
73 Anna → John
15 John → Anna



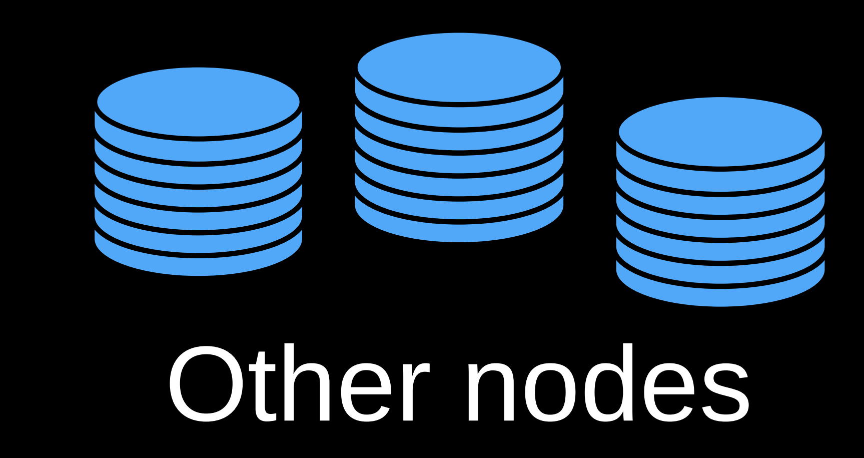




Consensus Protocol



Users



Other nodes

Proof of Work

```
sum + nonce + last_nonce = 100
```

```
sum                  nonce
 50  John → Lucy:     +50
120  Lucy → Anna:     -70
 73  Anna → John:     +93
 17  John → Anna:     -10
```

chain

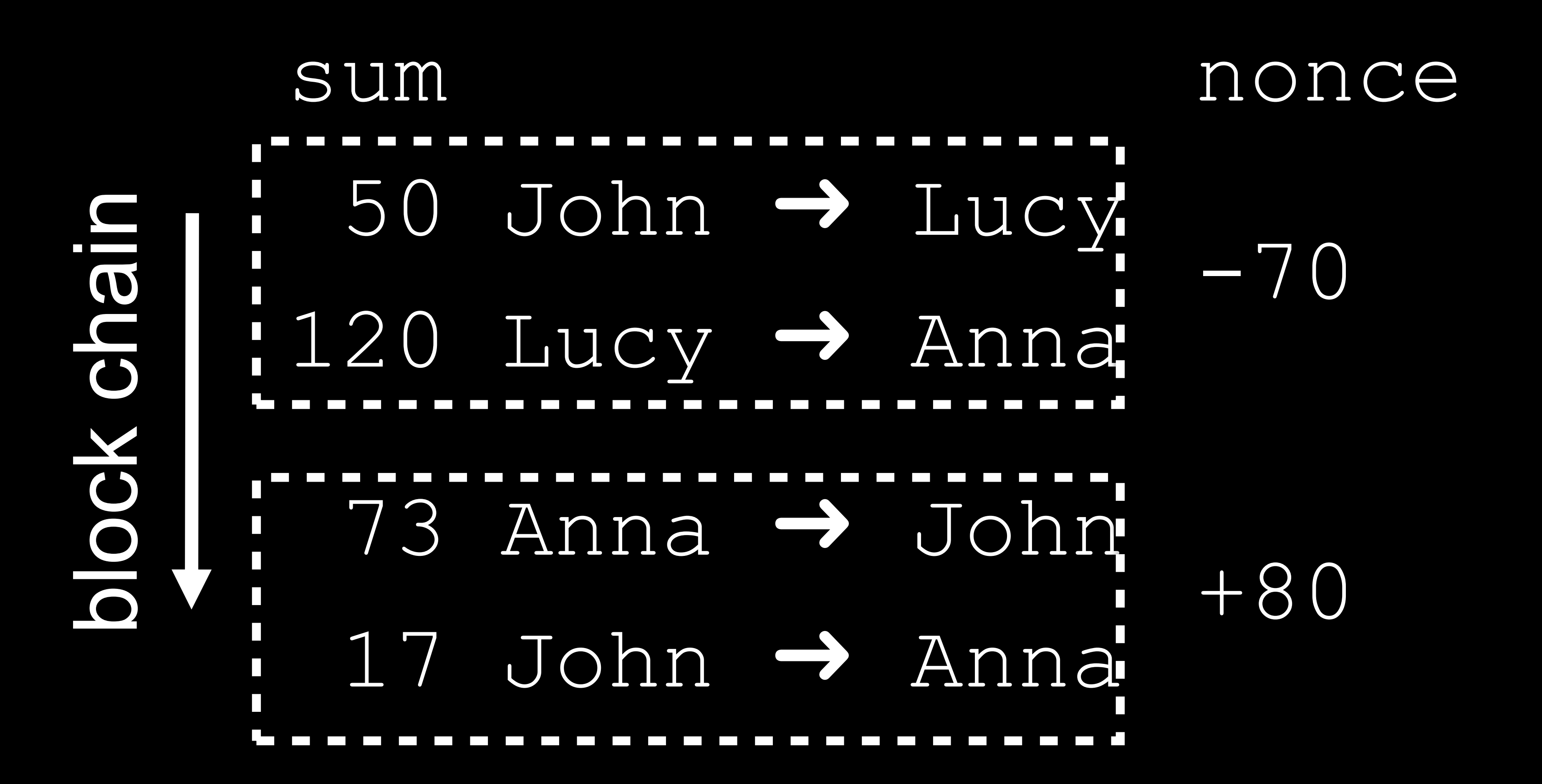
Three Confirmations

```
 50  John → Lucy:     +50
135  Lucy → Anna:     -85
 73  Anna → John:    +112
 17  John → Anna:     -29
```




Blocks

```
∑sum + nonce + last_nonce = 100
```

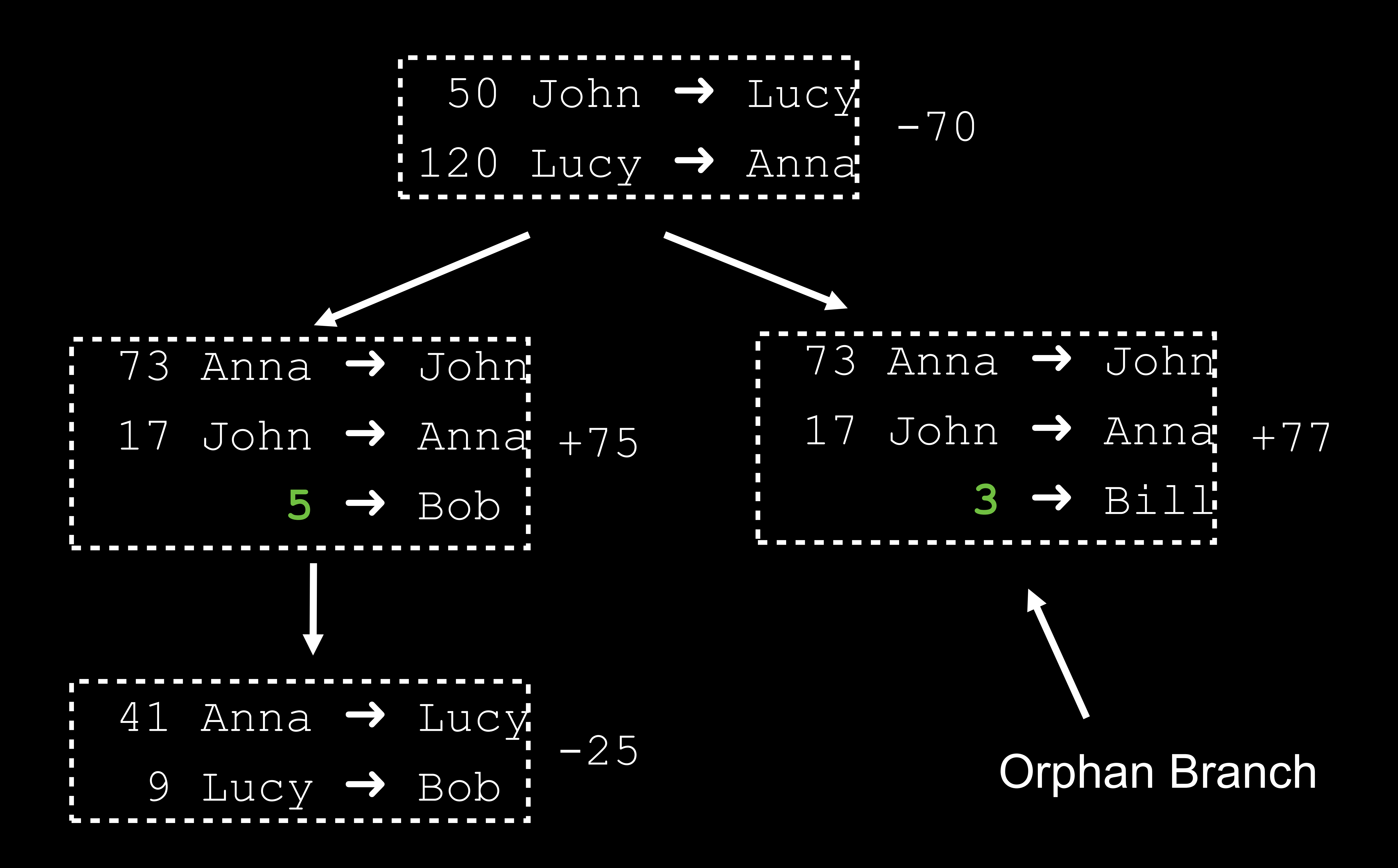




Mining


#32
sum
nonce
50 John → Lucy
120 Lucy → Anna
-70
73 Anna → John
17 John → Anna
5 → Bob
+75
Memory Pool
#11
sum
nonce
50 John → Lucy
120 Lucy → Anna
-70
73 Anna → John
17 John → Anna
3 → Bill
+77
17 John → Anna
Author

Branches

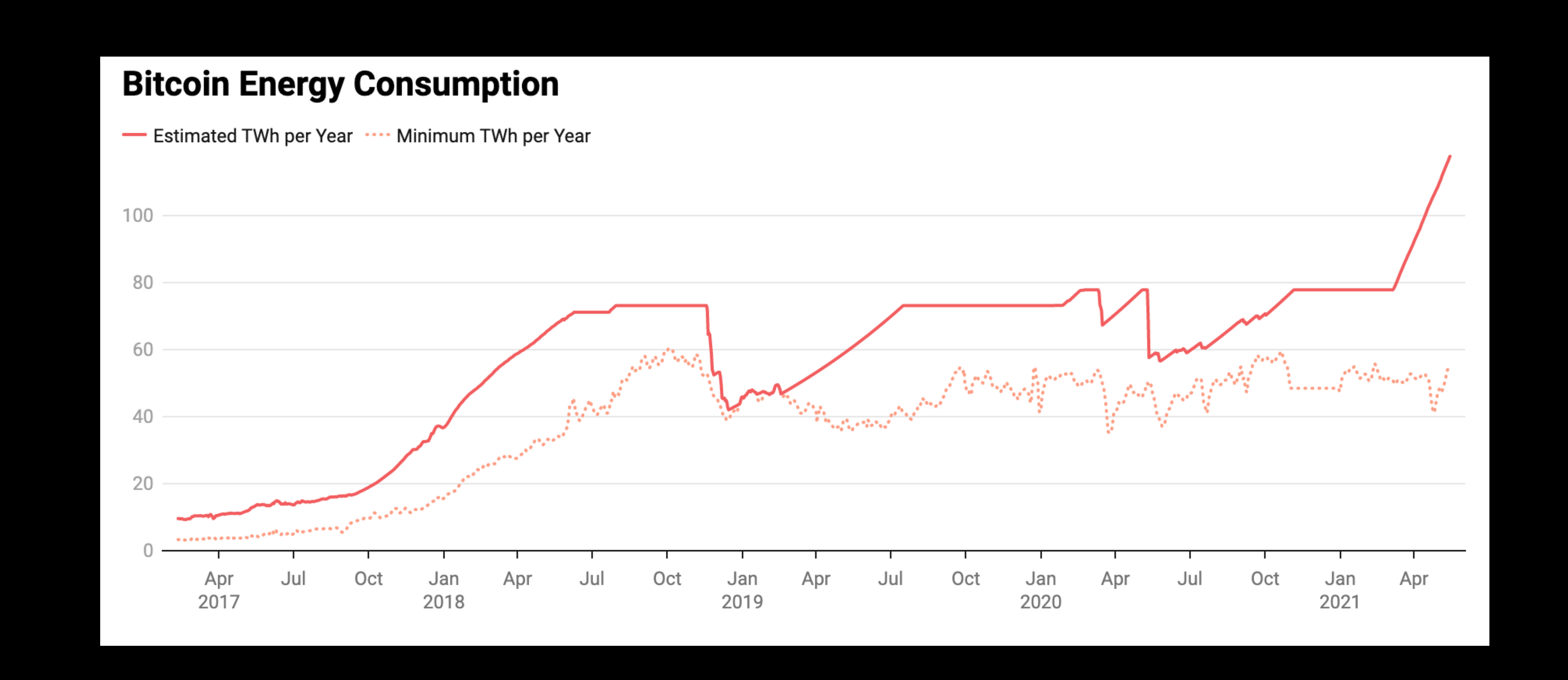

50 John → Lucy
120 Lucy → Anna
-70
73 Anna → John
17 John → Anna
5 → Bob
+75
73 Anna → John
17 John → Anna
3 → Bill
+77
41 Anna → Lucy
9 Lucy → Bob
-25
Orphan Branch


Issues:


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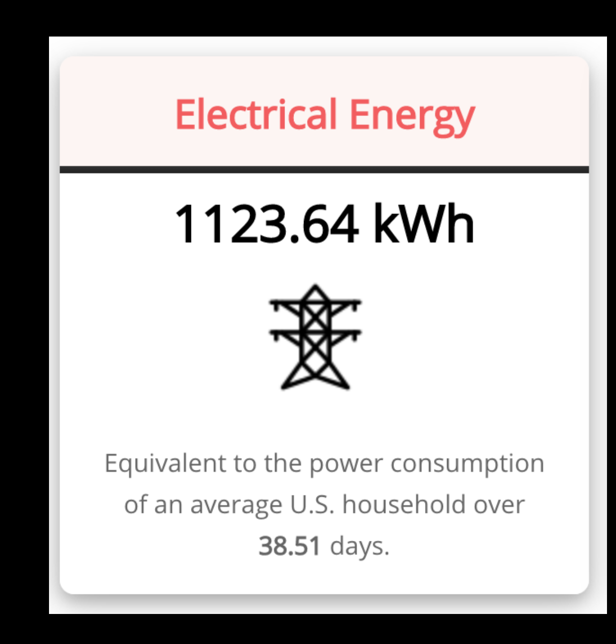
ISSUE #1:

The entire system is **very expensive**, due to competition for CPU power.





10,000 full nodes in Bitcoin

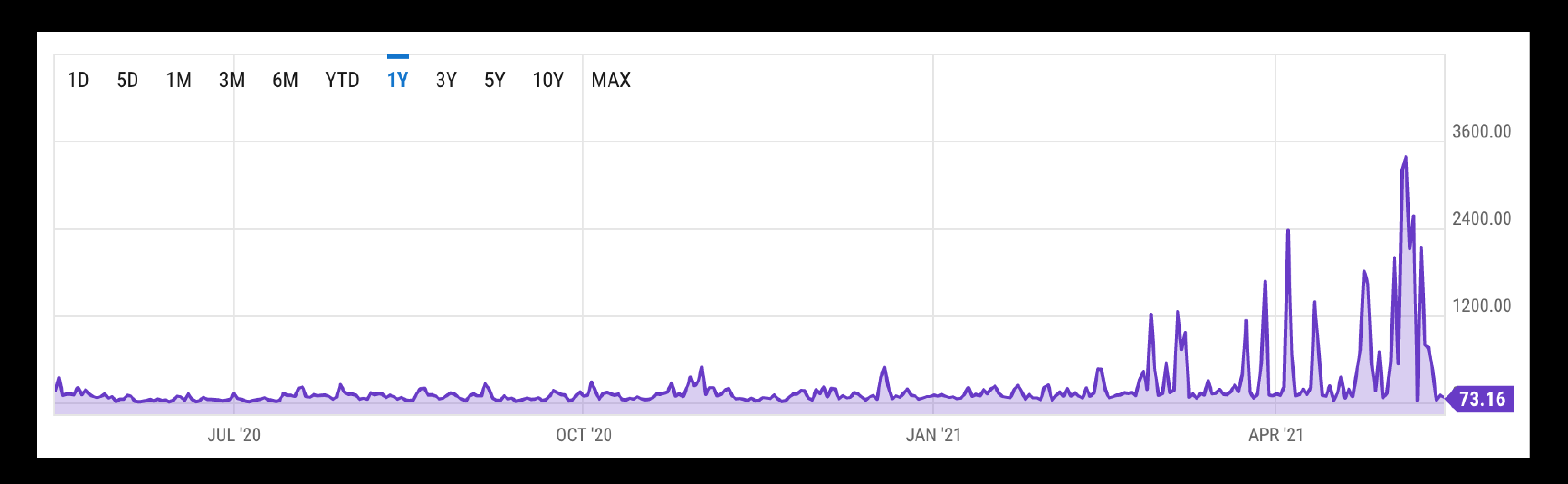


2M+ GPUs



Issue #2:

The confirmation time is **too long**, because blocks are expensive.



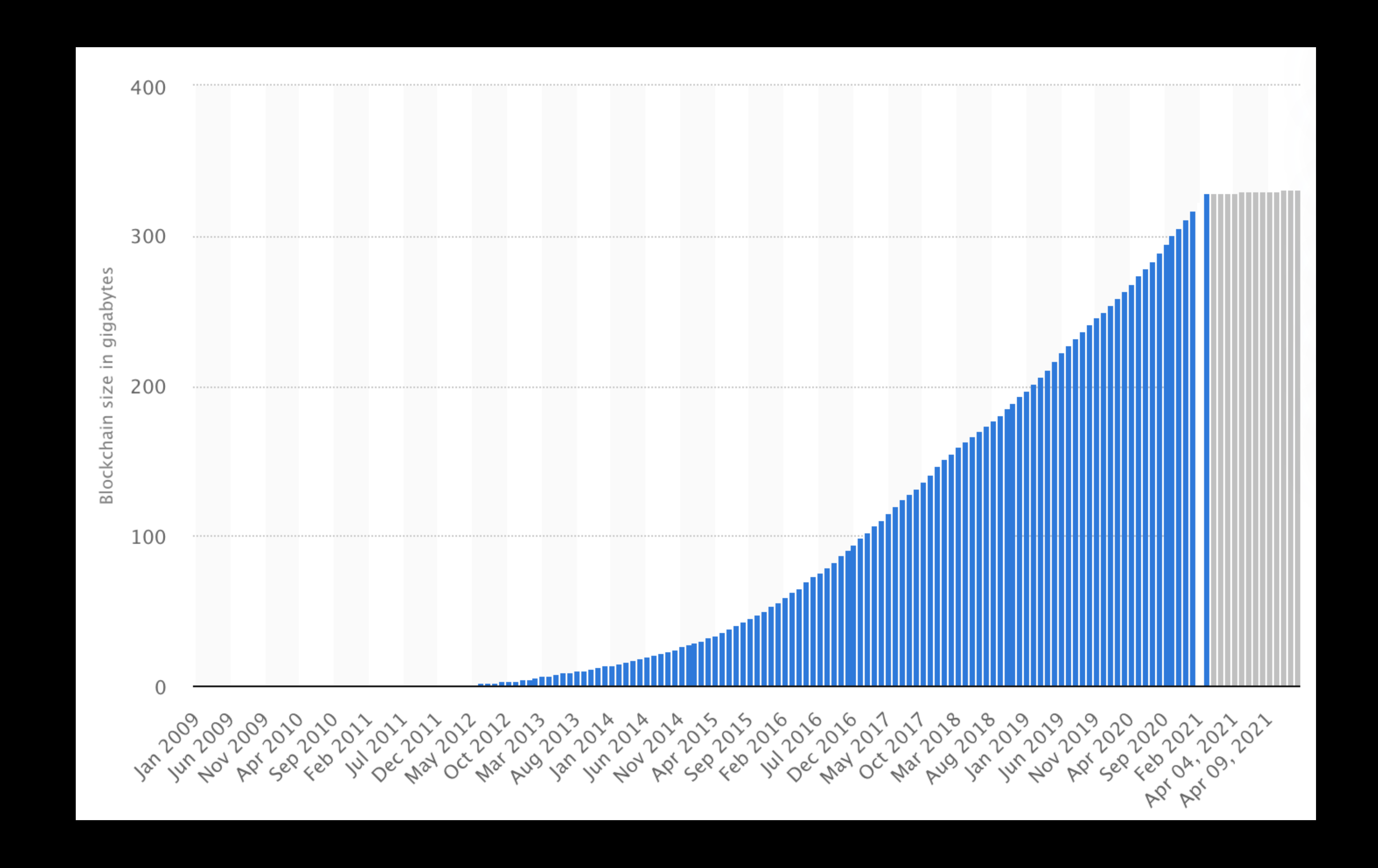
6 blocks, in minutes



ISSUE #3:

Nodes must be **powerful** (GPU+HDD) in order to be effective.

330Gb is the size of Bitcoin database as of now

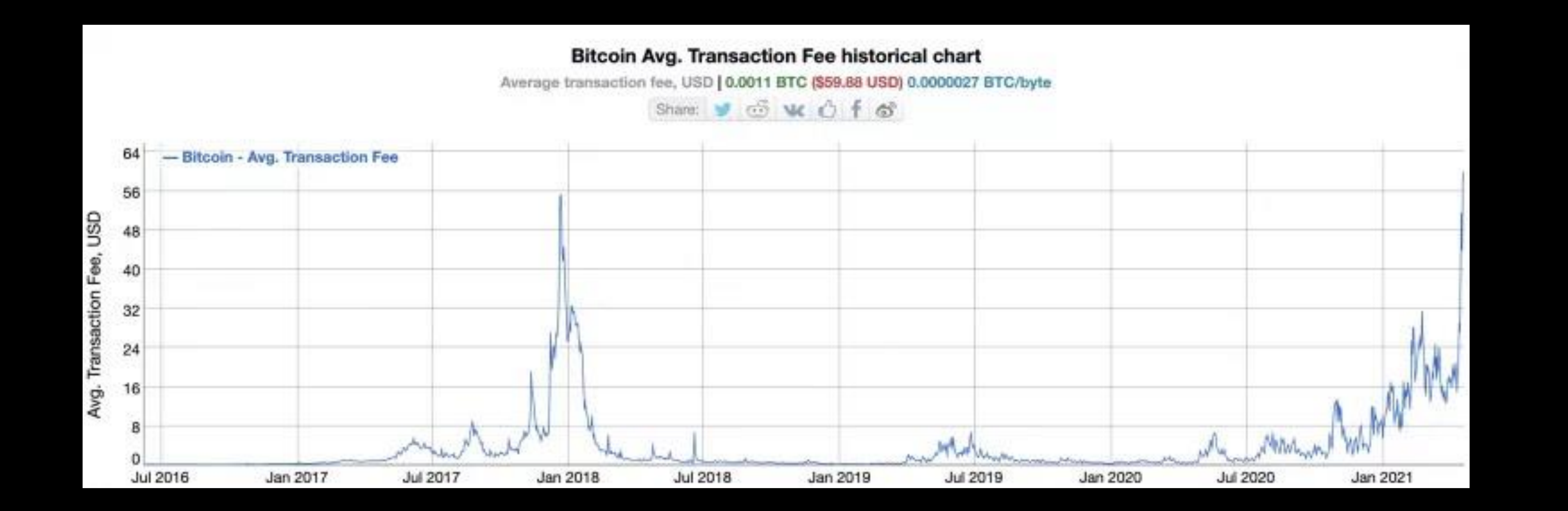




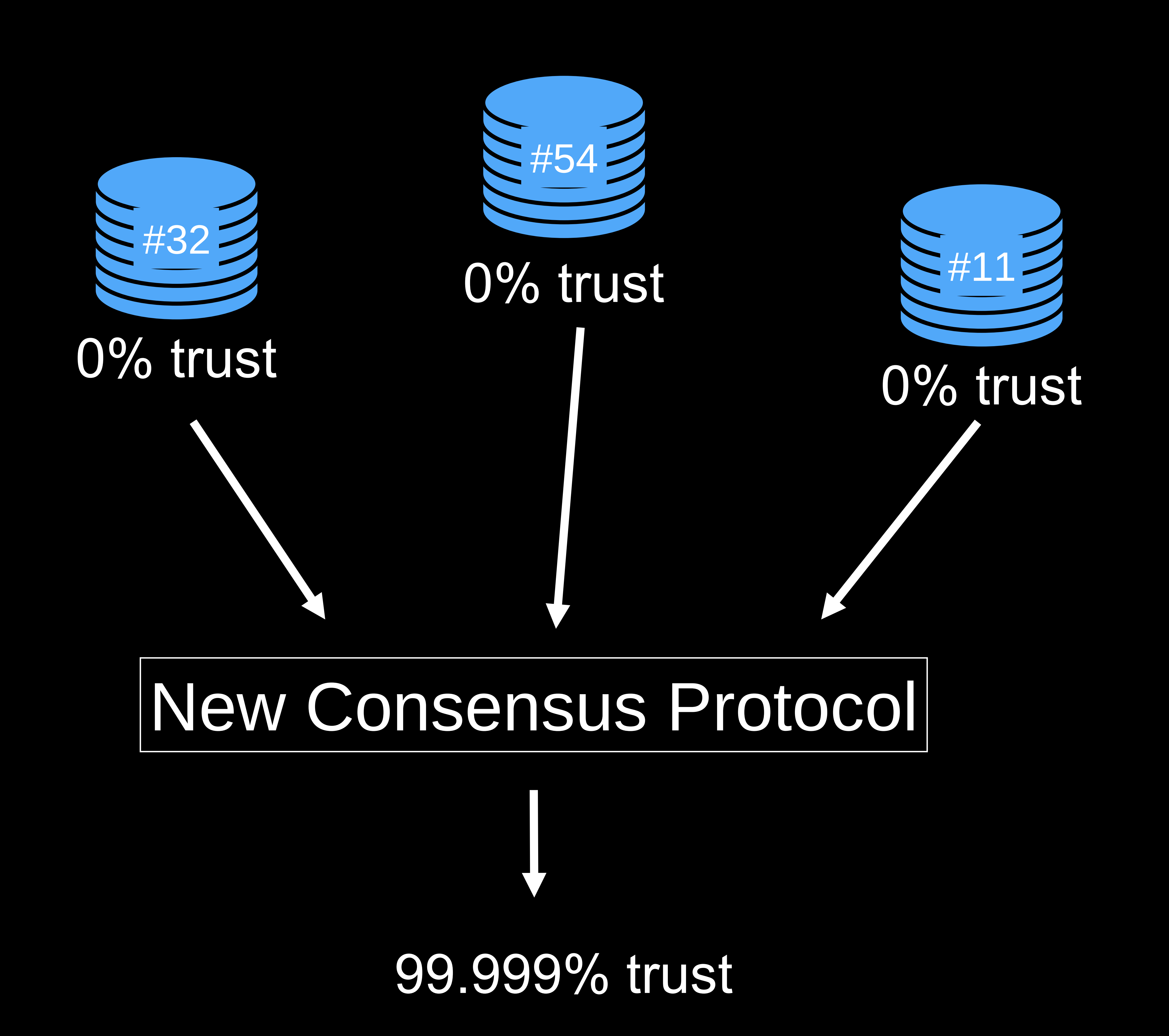
ISSUE #4:

Transaction processing is **expensive**, because requires computation power.

~$15 is the fee at the moment







Fast
Cheap
IoT





@yegor256

